REMARKS

This application has been amended so as to place it in condition for allowance at the time of the next Official Action.

The Official Action rejects claims 1-16 and 18 under 35 USC §103(a) as being unpatentable over NG in view of DESOUZA. Reconsideration and withdrawal of this rejection are respectfully requested for the following reasons:

Applicants note that while the introductory language to this rejection identifies a secondary reference as DESOUZA, the rejection later refers to the NG reference for its asserted disclosure of a conversion table. Applicants have reviewed both references and it would appear that the MIZUKAMI reference is the one intended.

The present method relates to generating a CRC code in connection with transmission data. In general terms, a CRC value is calculated for a particular sequence of data bits and transmitted with such data to a destination. Upon retrieval or receipt of the data together with its associated CRC, it is possible to perform both error detection and correction.

Under some protocols, a packet of data must be transmitted so as to have a particular CRC code. In such an instance, if the CRC code is arbitrarily set to the required value without causing the data in the packet to correspond to the CRC code, error detection and correction elements at the receiving element or as part of intervening transmission elements

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will identify this as an instance of data corruption. Accordingly, it is necessary essentially to work backwards from a desired CRC code to a sequence of data bits that produces such code.

To this end, there has arisen an approach of embedding, within the data bits of a packet, a variable field comprising a fixed number of bits. This variable field exists to allow the device that is required to transmit data with the specified CRC code to appropriately assign the bits in the variable field so that the total set of data bits agrees with the CRC code. Until the present invention, the only known way to determine the sequence of bits in the variable field that would result in the desired CRC code was a "brute force" approach of generating the CRC for each possible sequence. For n bits in the variable field, this requires the CRC calculation being performed 2^n times. This results in considerable overhead.

The present invention takes a completely different approach to generating the bits in the variable field of an overall data field to achieve a desired CRC code. The variable field is first set to a known value, which may be 0, and the CRC code is generated for the data field with the variable field at such initial value. The CRC code generated from the data field with the variable field set to an initial value is then compared on a bit-by-bit basis with the desired CRC code, and those bits which differ from one another are identified. This may be

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performed by performing a bit-by-bit XOR between the two CRC codes.

A table is then generated to identify how the modification of a bit at a given bit position within the variable field affects the CRC code that results from such change. This might be achieved by sequentially generating CRC codes with different variable field values. This may be achieved through what is sometimes referred to as a "walking 1's" pattern. In such a pattern, each bit in the variable field is set to 0 except for a single bit set to 1. For each of the sequential generations of the CRC code, the bit set to 1 is moved one place over.

By generating these n CRC codes for an n bit field, and performing an exclusive OR of each such CRC code and the CRC code that resulted from the variable field being set to 0, the resulting table provides for correspondence between a given bit in the variable field and the location of each bit in the CRC code that is changed thereby. For the purposes of the present method, this table is referred to as a conversion table, and the entries that identify the correspondence between a bit position in the variable field and the effect that bit has on the resulting CRC code are identified as corrective values.

Using the conversion table and its corrective values, it is then possible to determine what combination of corrective values XORed with one another produces the same value as that

which resulted from the exclusive OR of the desired CRC code and the CRC code that resulted from the variable field being set to 0. As each corrective value is associated with a particular bit position of the variable field, the value of the variable field that, by definition, produces the desired CRC code is one in which all bit positions are set to 0 except for those bit positions that correspond with the corrective values that were XORed with one another to produce the desired result. Using this scheme, the desired CRC can be calculated with certainty and with considerably fewer CRC code calculations than was required by the prior art, with a commensurate savings in resources.

Considering present claim 1, the step of establishing a temporary field value provides for choosing from among the available combinations of bits to make up the variable field, which will subsequently be used as the basis for choosing corrective values from the conversion table for determining how the difference between the temporary variable field value and an initial value affects the CRC code generated thereby. In the next step, this analysis is performed by reading those corrective values from the conversion table that correspond to a bit position of the temporary variable field value that is set to 1. All of such corrective values are then XORed with one another to produce a first calculated value. When the first calculated value corresponds to the desired CRC value, it is then known that that temporary variable field value achieves a desired CRC code.

Dependent claims 2 and 3 recite the details of how the corrective value entries in the conversion table can be calculated, as well as alternatives for the addressing scheme of the conversion table. Dependent claim 4 provides additional detail on how the correspondence between the first calculated value and the desired CRC value is determined in the final paragraph of claim 1. Claim 4 notes that the first calculated value is compared with the second calculated value, with the second calculated value being that which results from an exclusive OR of the CRC value of the data field when the variable field value is 0 and the desired CRC value. Claims 5 and 6 are similar to claims 2 and 3, depending from claim 4.

Applicants have amended independent claim 1 and the claims that depend therefrom in a manner so as to clarify the various steps of the present method.

Independent claim 7 recites an alternative embodiment of the present method in which the conversion table instead stores the first calculated values instead of the corrective values, as in claim 1. In the embodiment recited by claim 13, the conversion table is again modified, this time the entries in the table being the various variable field values, and the addressing scheme for such table being the value calculated by performing an exclusive OR of the desired CRC value and the CRC value that results from the variable field value being set to 0.

Independent claims 16 and 18 recite the method outlined above in different terms, as does new independent claim 19.

Accordingly, as disclosed by the present application as originally filed and as recited in each of the independent claims of the present application, the subject matter of the present application is a method by which the variable field of an overall data field is determined so as to produce a desired CRC value for the data field. The Official Action draws particular attention to column 3, lines 47-60. However, this passage merely identifies the point of whatever methods are disclosed by such reference, namely that of appending data blocks to the actual data content. Absent from this or any other passage is an indication of a dedicated series of bits in an overall data field used to achieve a desired CRC value for the overall data field.

The Official Action reads the second recited method step on the text from column 5, line 48 through column 6, line 9, as well as column 7, line 65 through column 8, line 7. Applicants have reviewed this and other language in the applied reference, all of which appears to describe a method which relies in all cases on the addition of bytes to the end of a data field, in stark contrast to the modification of an assigned field within an overall data field to achieve a desired CRC value. If the present rejection is maintained, applicants respectfully request that the particular elements of the NG disclosure that are interpreted as meeting each of the terms recited in the rejected

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claims be identified. Applicants have analyzed the reference in question and are unable to determine how the Official Action reads the claim terms on the disclosure of the NG patent.

The Official Action acknowledges that the NG reference does not explicitly disclose a conversion table. While the MIZUKAMI reference uses the term "conversion table", it remains unclear to applicants how the teachings of this reference can reasonably be combined with those of the primary reference to produce the methods as they are recited in the present claims. This is particularly so in light of the failure of the primary NG reference to teach or suggest that for which it is specifically offered, as outlined above. The analysis above applies to the remaining independent claims, and more particularly to the claims that depend therefrom.

Applicants respectfully suggest that in light of the fact that the primary NG reference is directed to a method that involves a CRC code but has nothing whatsoever to do with setting the value of a variable field within an overall data field for the purposes of desiring a CRC value, the NG reference cannot be reasonably combined with the MIZUKAMI reference or DESOUZA reference to teach or suggest the subject matter of the present claims.

The Official Action states that claim 17 is allowable but for its dependence from rejected base claim 16. However, in light of the analysis presented above, applicants believe that

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all claims in the application, including the original claims as filed, the original claims as now amended, and the new claims are all believed to be in condition for allowance at the time of the next Official Action.

If the Examiner has any questions or further clarification of any of the above points, the Examiner may contact the undersigned attorney so that this application may continue to be expeditiously advanced.

Please charge the fee of $200 for the extra independent claim and $50 for the extra claim of any type added herewith, to Deposit Account No. 25-0120.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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